Design report

Hiking Assistant

Group F

Overview

This design report provides a structured overview of the "Hiking Assistant" system to facilitate future maintenance, development, and deployment. The system consists of a smartwatch component and a Raspberry Pi-based hub that processes and stores data and provides a web interface.

Database Structure

The system uses an embedded **SQLite3** database stored locally on the Raspberry Pi. The database consists of two tables. Usernames (primary key) and corresponding passwords are stored in the “passwords” table. By default, one watch is meant to be used by one person, so default information is given, and it’s automatically stored in the database when first running the program.

The session data is stored in “sessions” table. Each session is separated with a session id and data is stored with a session user. Each session stores the kilometers, steps and burned calories for a hiking session. When logging in to the web UI, the login information is used to find only the statistics for the logged-in username.

The same information is given below in a table.

1. passwords

Field	Type	Description
username	TEXT	Primary Key; unique identifier for user
password	TEXT	User's password in plain text

- On first boot, the database is created automatically with a default user.
- Used for authenticating users via the web interface.

2. sessions

Field	Type	Description
session_id	TEXT	Primary Key; datetime as session ID
steps	INTEGER	Number of steps recorded during the session
km	FLOAT	Distance covered in kilometers
burnt_kcal	FLOAT	Calories burned during the session
session_user	TEXT	Username for the session user

- Only the statistics for the logged-in user are shown on the UI.

Software Design Description

Smartwatch Side

- Developed using **Arduino IDE**.
- Utilizes **TTGO T-Watch 2020 V3** and its associated libraries.
- Capabilities:
    - Step counting with BMA423 sensor.
    - BLE server communication.
    - UI for displaying current steps and controlling data logging.

File	Purpose
`hikingassistant.ino`	Contains code on the watch side; button creation, data transmission, etc.
`config.h`	Includes correct configurations.

Raspberry Pi Side

- Platform: Raspberry Pi 3B+
- Programming Language: Python 3.10
- Operating System: Raspberry Pi OS (Linux-based)
- Key Components:

File	Purpose
`hike.py`	Defines the HikeSession class for sessions
`bt.py`	Bluetooth handler class and functions for syncing with watch
`receiver.py`	Reads and parses incoming BLE data
`db.py`	Manages database creation, queries, and updates
`wserver.py`	Runs Flask-based web interface
`home.html`	Displays the session data on the website
`login.html`	Creates a login page for users

User Interfaces

Smartwatch UI

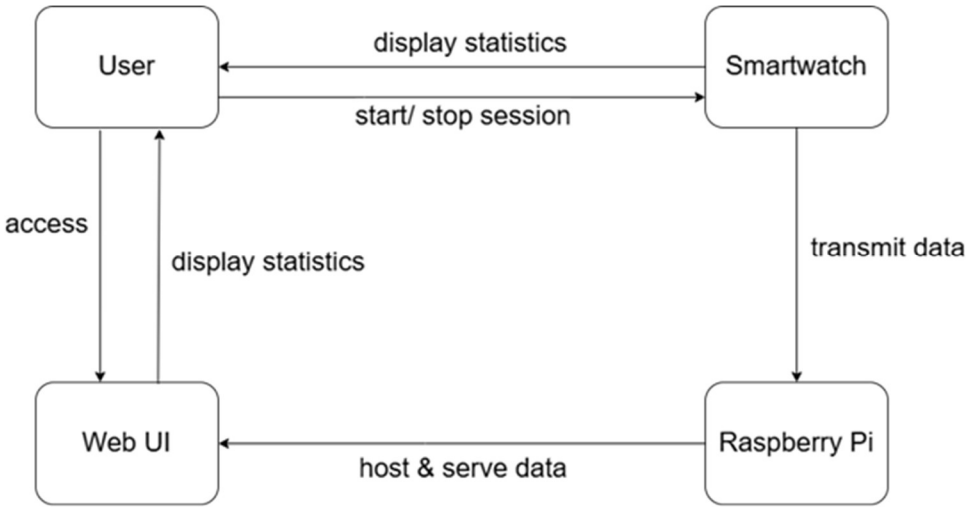
- Interface Elements:
  - START button
  - STOP button
  - UPLOAD button
  - NO button
  - Live step counter display
  - Displayed steps and corresponding distance
- Note: different buttons and information are displayed in different situations

Web UI

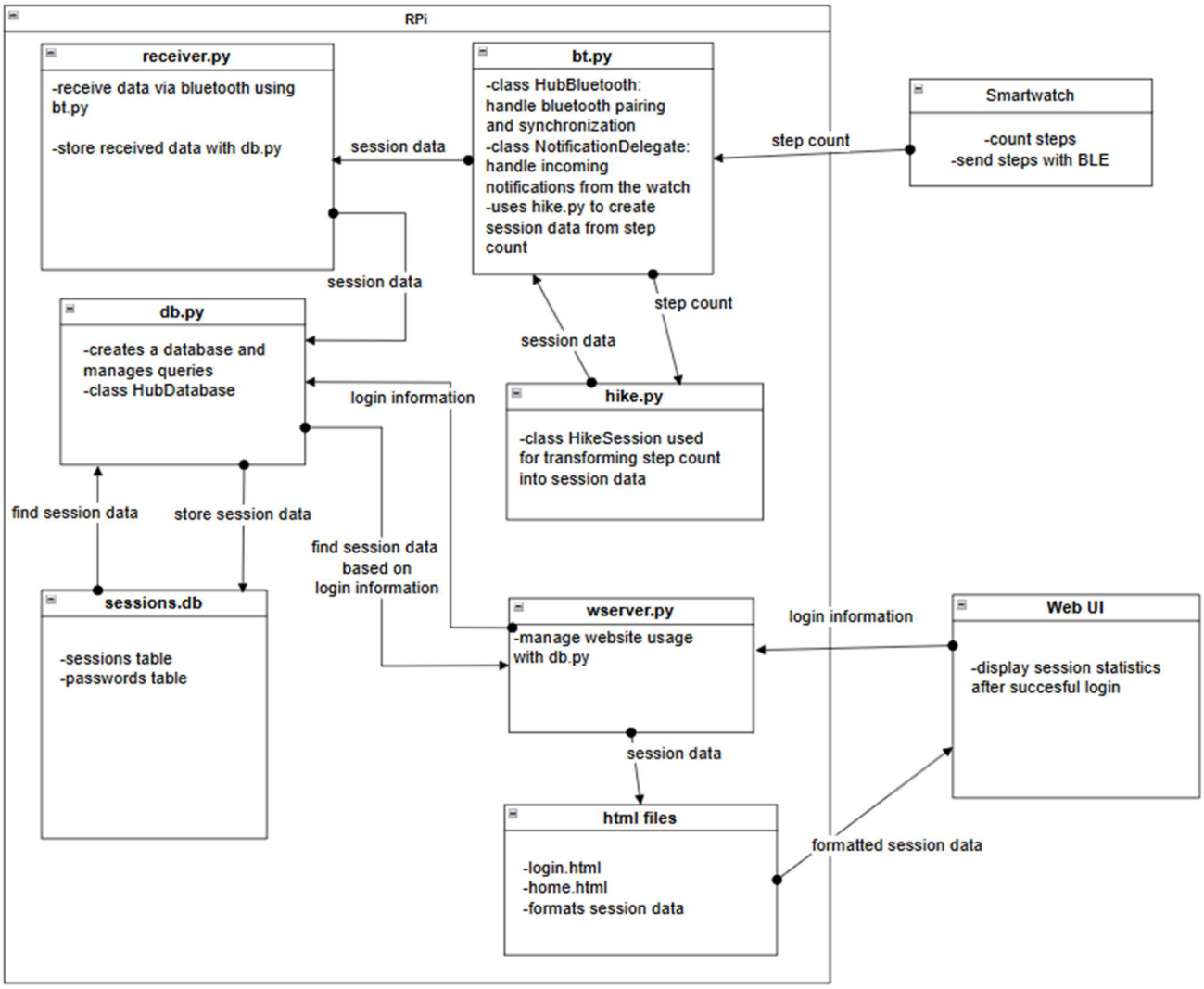
- Built using Flask + HTML
- Pages:
  - **Login Page:** Username and password form
  - **Sessions Data Page:** Session summary including datetime, total steps, distance, and calories.
- All data shown is specific to the logged-in user and protected via role-based access control (RBAC).

Diagrams

Context diagram



System architecture diagram



Database tables